until the date I mention, when I was resident medical officer to a large London hospital.

Working as I was frequently until a late hour in the pathological laboratory, which opened off the entrance hall, I had, in order to reach my room, to cross the hall obliquely and enter the corridor by a wide door, some 6 feet wide, with folding glass doors, which were, as a rule, fastened back. The hall and corridor were unlighted. I usually walked well out into the hall from the door of the pathological laboratory, turned to the right when I thought I was opposite the door opening into the corridor, and then walked straight forward between the doors. I found, a good deal to my surprise, that though in the dark (even though I shut my eyes) I could judge as I walked through, very accurately, to which of the two doors I was nearest. I made a large number of observations, and the constant result was sufficient, I think, to preclude any idea of mere coincidence. I found I could even form a trustworthy estimate if I was only a few inches nearer one side than the other; and, further, if I gradually moved towards one or other side, when I got within a few inches of the door I "felt" that I was getting very close to it. The way in which I felt this is difficult to describe, but the sensation of "nearness" was situated in my face, on my forehead and cheeks, and seemed to be particularly keen on turning my cheek in the direction of the surface that I was approaching. The conclusion that I came to was that there were two different processes involved; in the first case (1) the nearness of a solid body was made evident by difference in the reflection and resonance of my footsteps as I walked, and in (2) the differences in the reflection of the heat of the face from a surface at varying distances were the cause of the sense of nearness or farness. It will be seen that I had arrived at almost precisely the explanation which Dr. McKendrick puts forward as the explanation of the power of the blind to recognise their relation to externals.

(1) To test my theory of sound reflection I tried the effect of walking in stockinged feet, and found that it sensibly diminished my power of recognising my position; this is, of course, quite analogous to the difficulty, which Dr. McKendrick describes, experienced by the blind when there is snow upon the ground. A still more conclusive test of the correctness of the theory would be to go through the same experiments with the ears effectively stopped.

Since I made these first observations I have noted many other occasions on which minute sound changes have given rise to a correct idea of relationship. Anyone may readily prove for himself in walking in the dark or with the eyes shut along a corridor with doors opening off it, some of which are open and others closed, how easy it is to recognise when one comes opposite one of the open doors, and a very little consideration will convince him that the explanation lies in the difference in resonance from the walls of the corridor and from the space into which the open door leads. Again, I have more than once noticed, when riding on top of a tram-car in the crowded city, that I have been "sensible" of another passenger sitting quietly down on the seat behind me, not through any sound that he has made, but by his cutting off from my ears a portion of the general roar of traffic. It is the finer sound indications of this type, to which we customarily pay little heed, since our eyes yield us more rapid and more complete information, that convey so much information to the blind, whose ears, if not more keen, are more intent, and the blind man's stick undoubtedly serves, not only to feel his way with, but by its tap to supply a source of sound the resonance of which may be noted. There is still much haziness, even among those who have to do with the management of the blind, as to their psychology, and one superintendent of a blind asylum with whom I am acquainted, indulging in that mysticism which at the present day is so fond of explaining phenomena, of which by experiment one may learn something, by theories of which we know nothing, would drag in that blessed word "telepathy" to explain the blind man's knowledge of surrounding objects.

(2) The second principle involved, viz. the reflection of the heat of the face from adjacent surfaces, is not so easily verifiable. I feel fairly confident, however, that accurate observations with a delicate surface thermometer would show that the cheek was receiving a certain amount of reflected heat as it was approached near to a solid object. That the skin of the cheek is peculiarly sensitive to the degree of temperature will be readily admitted by anyone who has seen a laundress testing the proper heat of her iron by holding it to her face. Further, the repetition of the experiment with the use of a mask, which would minimise the sensitiveness of the skin to changes of temperature, has struck me as likely to give conclusive results, and I am particularly interested to find this supposition supported by Dr. McKendrick's statement that the blind do not so readily avoid an obstacle if the face is covered.

CHARLES H. MELLAND.

Manchester, May 29.

The Pollination of the Primrose.

IN NATURE of May 20 the reviewer, in the course of his appreciative and interesting notice of my book, "Life-histories of Familiar Plants," states:—"We notice that, without stating definitely what insect pollinates the primrose, the author refers to the bee or moth as doing it, in a misleading way. He would have been wiser to ask readers to notice what insect is really effective in the case of this plant. Neither honey-bees nor moths are known to be so." Regarding this point, on p. 78 I have written as follows:—"Now, watch the occasional bee that makes a visit to these two different types of flowers. Here is one alighting. With the sudden weight thus imposed upon it the flower sways," &c. This passage, of course, refers to a humble-bee, as the reference to "the sudden weight" clearly implies. It is true that I did not definitely state that it was a humble-bee, but, on the other hand, I have nowhere in the chapter referred to the honey-bee.

Probably the reviewer, and also readers of NATURE, will be interested in the two following notes from my diary for this year:—April 21: "Saw the first small white butterfly of the season, in garden, about 2 p.m. It was sipping nectar from a primrose flower." (Amongst the photographs illustrating the book referred to above it will be remembered that there is one showing a green-veined white butterfly feeding amongst primrose flowers.) May 3: "A species of large, black humble-bee in garden visiting only primroses and polyanthuses. Saw five of them within the space of two yards. One was a large female (the largest humble-bee that I have ever seen), and was apparently entirely black. In some of them, the pollen baskets stood out distinctly as yellow patches on their legs. One other specimen had an orange-coloured thorax." I could not at the time make a capture of one of the bees, and as cold weather followed, and the primroses had nearly done blooming, I did not see the bees again.

While possessing very little knowledge of the species of humble-bees, I am inclined to think that the species I saw was *Bombus harrisellus*, the large specimen being a queen, the one with the orange-coloured thorax a male, and the remainder neuters. Perhaps some of your readers can give some information regarding these bees, and may have observed them on primroses. So far as my observations went, the bees confined their attention exclusively to the primrose family.

JOHN J. WARD.

Rusinurbe House, Somerset Road, Coventry, May 25.

REFERRING to a question raised in NATURE of May 20 (p. 345), the writer of the article "Recent Studies on Animal and Plant Life" may accept it as a fact that the primrose flowers are visited both by humble-bees and by moths, among which may be particularly named the humming-bird and bee hawk-moths. The flowers are also frequented by dipterous insects, a specimen of one of which is enclosed, by which, for the long-styled form at least, pollination may perhaps be sometimes effected.

W. E. HART.

Kilderry, Londonderry, Ireland, May 24.

THE determination of the insects that pollinate the primrose is an old problem, and my remarks in the review under consideration were made with the view of eliciting

more observations on this point. The hawk-moths mentioned by one correspondent are scarcely sufficiently common to serve as the usual pollinating agencies, and the dipterous insect (apparently a Volucella) arrived in too fragmentary a condition for identification. The Bombi certainly visit these flowers, but the vague "bee" used in the book under review would certainly lead to confusion with the true honey-bee, which is not known to visit primulas. I may add that in the Manchester Museum there is a series of insects taken by Prof. Weiss on the primrose. No moths are included amongst them.

THE REVIEWER.

An Optical Phenomenon.

Is your correspondent "V. P." (NATURE, June 3, p. 398) perfectly sure that there is not in the glass pane in question one of those flattened oval air bubbles so common in window glass, which he may have overlooked? The phenomenon of the dark disc of shadow with the bright edge so exactly corresponds with the effect produced by these common flaws in glass that, in spite of his assurances, I cannot help suspecting that he may have misjudged the angle of incidence of the sun's rays. A window is before me as I write which presents identically the same phenomenon, and I was nearly being misled until, with a pencil point laid on the pane, I tracked the shadow to its source, which was much higher up on the window than I should have judged.

CHARLES E. BENHAM.

28 Wellesley Road, Colchester.

Dew-Ponds.

IN the recent correspondence on this subject several rival theories have been put forward to account for the supposed fact that certain ponds situated on the tops of hills have a plentiful supply of water. It seems to me that no satisfactory solution of the question can be expected until much more definite data are at hand.

What is wanted is a detailed, contoured survey of a typical "dew-pond" with its drainage area, and a year's observations of the height of water in it, an estimate of the number of cattle using it, rainfall and hygrometric observations in the neighbourhood, and a section showing the construction of the bed of the pond and adjoining slopes. If someone interested in the question and resident in the neighbourhood of one of these ponds would undertake the work, it would be of far more value than twice the labour spent in founding theories on insufficient data.

Wirksworth, June 12. L. GIBBS.

SPRUCE'S TRAVELS IN SOUTH AMERICA.[1]

DR. ALFRED RUSSEL WALLACE has rendered a great service to the scientific world, not only in having consented to rescue from oblivion the account of Spruce's remarkable travels, but also by the admirable way in which he has edited the manuscripts placed in his charge. Spruce's journal, which forms the substance of these volumes of about 1040 pages, has been carefully edited and considerably condensed. Passages of no particular interest have been omitted, and short summaries by the editor take their place. Several letters to Sir William Hooker, Mr. Bentham, and personal friends have been inserted which carry on the narrative and give a more life-like impression of Spruce himself.

These letters, which are keenly alive and full of human interest, form some of the most interesting portions of the book. Those to Mr. Bentham show the ardent botanist fired with enthusiasm for his work, whilst those to his friend Mr. Teesdale reflect the character of the man himself, and give a vivid picture of the every-day occurrences and of the perils which he experienced.

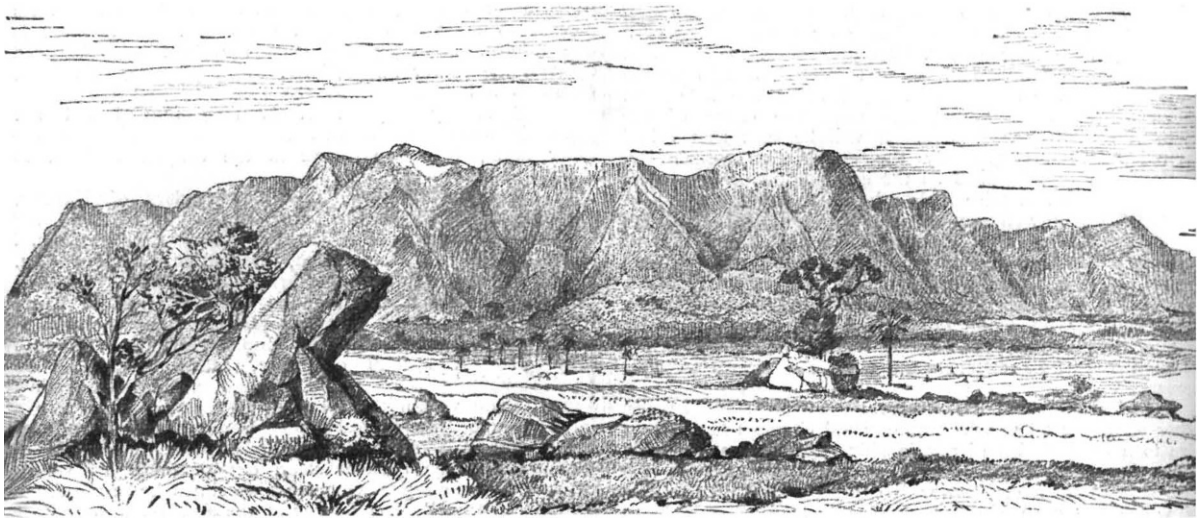

FIG. 1.—Cerro Duida (8000 feet), from the Cross near the Village of Esmeralda. Looking north. (R. Spruce, December, 1853.) From "Notes of a Botanist on the Amazon and Andes," vol. i.

At times the reader is inclined to complain of an occasional want of continuity and of abrupt changes of subject, but such blemishes are not common, and, owing to the necessity for condensation, could perhaps hardly have been avoided.

The first volume, covering the period from July, 1849, to January, 1855, deals with Spruce's travels on the Amazon and Rio Negro, including a journey along the Casiquiari and to the Orinoco cataracts.

The second volume opens with the account of the voyage from Manaos to Tarapoto, and continues his travels in the eastern Andes of Peru from that place, his excursions in Ecuador and in the Cinchona forests, and his last years on the western side of South America. There are also botanical and historical notes, which conclude with a highly exciting story of a hidden treasure of the Incas. The period spent in South America covered by this volume is from March, 1855, to April, 1864.

[1] "Notes of a Botanist on the Amazon and Andes." By Richard Spruce. Edited and condensed by Dr. Alfred Russel Wallace, O.M., F.R.S., with a Biographical Introduction, Portrait, 71 illustrations and 7 maps. 2 vols. Vol. i., pp. lii+518; vol. ii., pp. xii+542. With a Glossary of Native Names and Index. (London: Macmillan and Co., Ltd., 1908.) Price 21s. net.